COMBUSTION WEBINAR

Detonation Cell Cycle and Autonomously Propagating Energy Centers (APEX)

Speaker: Prof. Hai Wang, Stanford University

Time: *13:00 PST,* March 30th 2023 *(16:00 EST; 22:00 Paris)*

Zoom meeting link: https://gatech.zoom.us/j/96549900704
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Biography: Hai Wang is Professor of Mechanical Engineering at Stanford University. Prior to his appointment at Stanford, he was the Northrop Chair in Engineering and Professor of Aerospace and Mechanical Engineering at USC. He received his Ph.D. in Fuel Science from Penn State in 1992. He was a Professional Research Staff at Princeton University from 1994 to 1996 before starting his faculty career at the University of Delaware. He is best known for his work on the mechanisms of PAH and soot formation in combustion, and the development of chemical kinetic models for fuel combustion. He has made contributions in the application of ab initio quantum chemistry and reaction rate theory in chemical kinetics. He developed stochastic methods for detailed modeling and uncertainty quantification. He contributed to the transport theories of nanoparticles and large molecules, atmospheric heterogeneous chemistry, material synthesis, characterization and applications in solar cells and batteries. He was the recipient of the AIAA Propellant and Combustion Award in 2018, and the Humboldt Research Award in 2019. He is a Fellow of ASME and an inaugural Fellow the Combustion Institute. He currently serves as the Co-Editor-in-Chief of Progress in Energy and Combustion Science and the Vice President (President-Elect) of the Combustion Institute

Abstract: This talk discusses key findings from a recent multi-university collaborative study of gas-phase detonations. We will present numerical simulation results and analyses of the structure of detonation cellular structure focusing on the mechanisms of energy and momentum transfers in a detonation cell cycle. Vorticity generated from the triple-point shear layer produces microscopic jetting at the base of a detonation cell following triple-point collision, and the high-speed jet is responsible for the production of the overdriven incident shock that transverses through the cell as it decays in its shock speed. Collectively, the energy and momentum transfer mechanisms lead to the continued production of Autonomously Propagating Energy Centers (APEX) as the driving mechanism for propagating detonation waves.

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